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LODGEPOLE PINE

A LUMBER SPECIES



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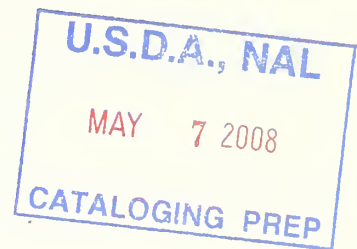
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LODGEPOLE PINE--A LUMBER SPECIES

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Division of Forest Economics



INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION
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Ogden, Utah
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FOREWORD

Not so long ago, lodgepole pine was, in the eyes of many, a weed tree with limited industrial use. However, during the last few years it has come into greater use for poles, pulp, and lumber. It is apparent now that the species has considerable industrial potential, and that there is reason for optimism about its future. The purpose of this report is to appraise the suitability of lodgepole pine for lumber--to consider its attributes and deficiencies for this purpose.

The Knapp Lumber Sales Company of Portland, Oregon and the South Fork Lumber Company of Belgrade, Montana, furnished some of the information which follows. Both concerns have pioneered in the production of lodgepole pine lumber for national markets. We are especially indebted to Joel L. Frykman for his help in gathering the information and making the analysis on which this report is based. Other Forest Service men in both Regions 1 and 4 also helped in collecting the information. The interpretations in the report are ours.

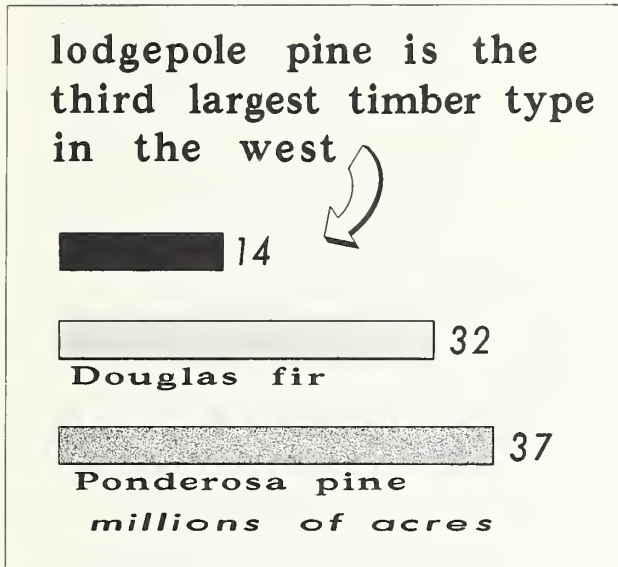
HARRY W. CAMP, Chief
Division of Forest Economics



Figure 1.--A lodgepole pine stand. The trees in this stand have little taper and are generally free of limbs. They will make good lumber.

THE RESOURCE

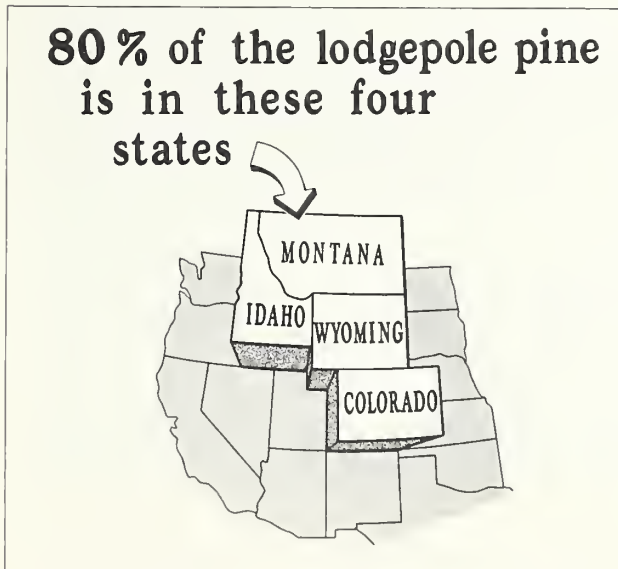
LODGEPOLE PINE IS AN IMPORTANT WESTERN TIMBER SPECIES.....



There are 14.5 million acres of lodgepole pine type in the United States. From the standpoint of area, it ranks third behind the Douglas-fir and ponderosa pine types in the West.

Figure 2

...AND IT GROWS MAINLY IN THE ROCKY MOUNTAINS.



11.6 million acres of the type are in four Rocky Mountain States.

Montana	4.7
Idaho	3.1
Wyoming	1.9
Colorado	<u>1.9</u>
Total	11.6

Figure 3



Figure 4.--Until recently, most of the lodgepole pine lumber produced was sawed by small mills (above). Now larger mills are being built to utilize this timber (below).

THE OPPORTUNITY

LODGEPOLE PINE HAS BEEN GAINING IN THE LUMBER MARKET.....

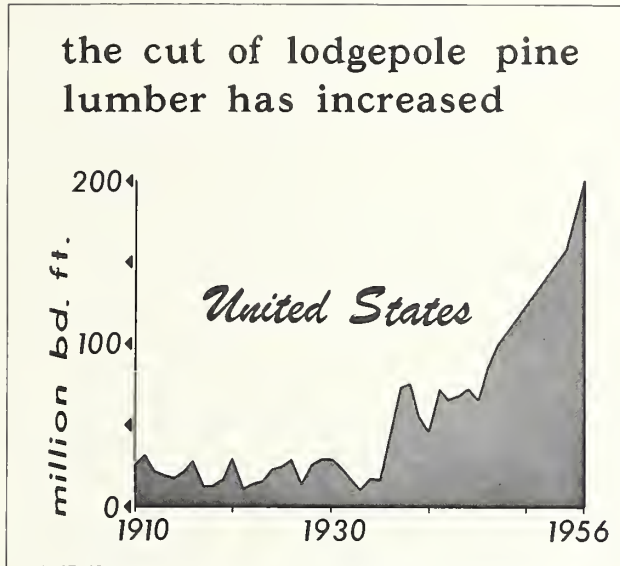


Figure 5

Lodgepole pine lumber production declined between 1910 and 1933. The species could not compete effectively with lumber from larger trees. The reverse trend and rapid rise in production in recent years reflects a shortage of the more sought-after species, and the new opportunity for lodgepole pine.

...IT OFFERS AN OPPORTUNITY FOR FURTHER INDUSTRY DEVELOPMENT.

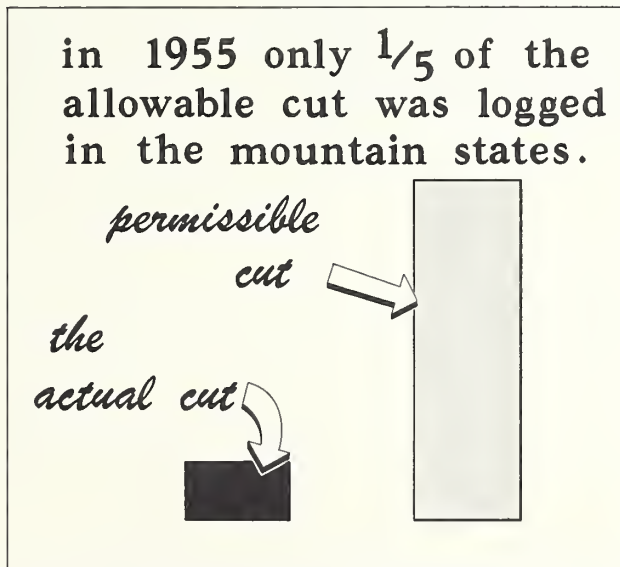


Figure 6

Lodgepole pine timber in the Rocky Mountains could support a much larger cut than it has. Two hundred million board feet were logged in 1955. The cut could be sustained at about 1,000 million board feet per year.

LODGEPOLE PINE AS A LUMBER SPECIES

IT HAS THE PHYSICAL
PROPERTIES TO MAKE
GOOD LUMBER

Lodgepole pine is one of our better softwoods. Table 1 compares it with ponderosa pine on the basis of some important physical properties. The results of this comparison can be summarized briefly. Lodgepole pine is slightly heavier, a little stronger, has about the same shrinkage rate, and is slightly harder than ponderosa pine. It works nearly as well as ponderosa pine and it takes paint just as well. Consequently, boards of the same size and grade of either species could be used interchangeably for most uses and should be worth about the same.

Table 1.--Lodgepole pine compares favorably with ponderosa pine in important physical properties

	<u>Ponderosa pine</u>	<u>Lodgepole pine</u>
Weight--pounds per cubic feet (8 percent moisture)	27.5	28.2
Strength--static bending, fiber stress at proportional limit, P.S.I. (12 percent moisture content)	6,300	6,700
Shrinkage based on dimensions when green; dried to 6 percent moisture content.		
Tangential (percent)	5.0	5.4
Radial (percent)	3.1	3.6
Hardness--load required to imbed 0.444- inch ball to $\frac{1}{2}$ its diameter, pounds (12 percent moisture content)	450	480
Painting class ^{1/}	3	3

^{1/} Painting classification used by Forest Products Laboratories
Wood Handbook, U.S.D.A. Handbook 72.

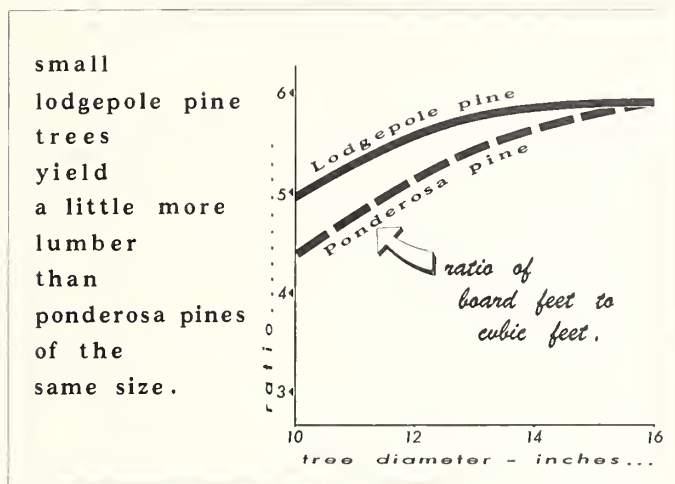


Figure 7

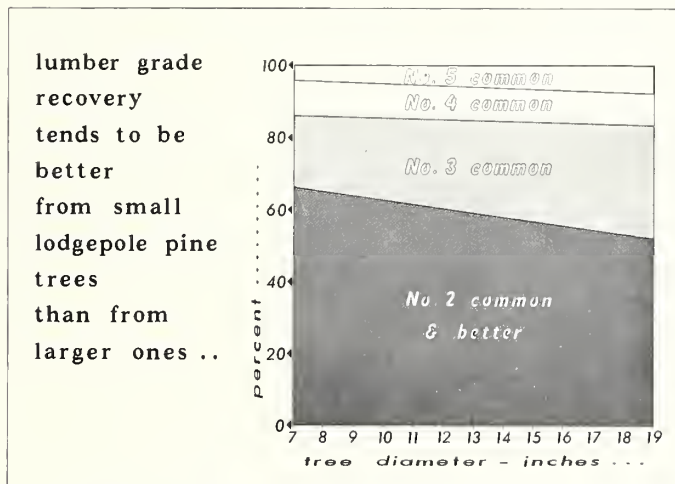


Figure 8

LUMBER VOLUME RECOVERY IS GOOD

Among small trees, lodgepole pine has good form. It is a smooth, uniform tree with little taper. As a result, in the smaller diameters, it produces more lumber per cubic foot of log than does ponderosa pine. For example, International board-foot volume tables show lodgepole pine trees in the 10- and 12-inch class will yield 10 to 15 percent more lumber per cubic foot than ponderosa pine in the same classes, (fig. 7). This advantage however, exists only in trees less than about 16 inches in diameter. On the average, lodgepole pine trees larger than 16 inches in natural stands do not have as good form as smaller trees.

THE SPECIES PRODUCES HIGH GRADE LUMBER

The T-bone steaks of the lumber business are its clear, select boards. Its hamburger is the lower common grades. Since lodgepole pine is not a big tree, it does not produce much T-bone quality lumber and neither does it produce a large proportion of hamburger. Most of the volume is in the tree sizes which produce the highest proportions of the better common grades (fig. 8). More detailed data on the relation of tree size to grade recovery are presented in table 3 in the back of this report.

Table 2 on the following page, compares lodgepole pine lumber recovery with the average grade recovery of ponderosa pine in the Inland Empire in 1955. Lodgepole pine produced 85 percent 1, 2, and 3 common lumber compared to 34 percent for ponderosa pine.

Table 2.-- Comparisons of grade recovery

	Ponderosa pine Percent	Lodgepole ^{1/} pine Percent
Selects	14	$\frac{1}{2}$
#1 and #2 common	11	48
#3 common	23	37
#4 common	18	12
#5 common	6	$\frac{1}{2}$
Shop	15	-
Box, molding, and shorts	<u>13</u>	<u>2</u>
	100	100

^{1/} Average grade recovery determined from a 20-percent sample of a year's production of a modern medium-size mill.

width recovery. Over 90 percent of the lumber recovered from trees 11 inches in diameter and smaller is in 2-, 4-, and 6-inch boards. It is not uncommon in lodgepole pine stands to find half or more of the volume in trees of these sizes. Additional information on the effect of tree size on lumber width recovery is presented in table 5.

We hope markets (such as pulpwood) will develop to utilize the

almost all
of the lumber
from
11 inch
and smaller
lodgepole pine
trees
is
6 inches & less
in width.

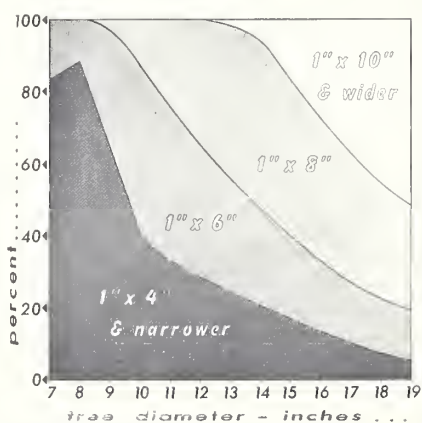


Figure 9

MUCH OF THE LUMBER IS NARROW BOARDS

Boards are not sold by grade alone; they are sold by grade and size. Because lodgepole trees are small, a large part of the lumber cut is in narrow widths. Moving these narrow boards in the proportions in which they occur is the major merchandising problem of the lodgepole pine lumber industry. Six-tenths of the lumber recovered at one modern mill was in boards 6 inches wide and narrower (table 4).

Figure 9 shows the effect of tree size on

the smaller trees. However, until such markets as pulpwood are available, sawmill operators will have to utilize as many of the smaller trees as possible. Unless many of the small trees are taken, the lodgepole pine stands cannot be cut heavily enough to get a new crop of trees started.

As figure 10 shows, the narrow boards produced in such abundance from small trees are

narrow widths
of
lodgepole pine
lumber
sell for
substantially
less
per board foot
than
wider widths.

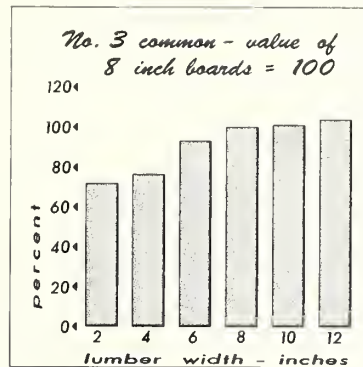


Figure 10

narrow
boards
hold down
the
lumber value
of
small trees.

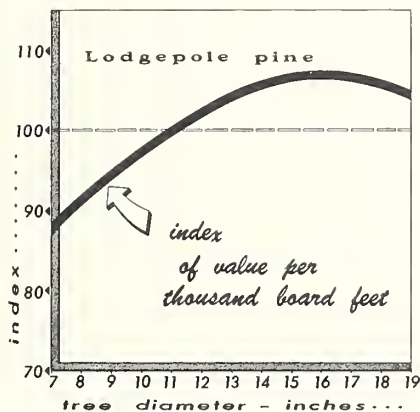


Figure 11

worth less than wide ones.
in 1955, number 3 common
1 x 4's brought 20 per-
cent less than 1 x 8's.

Value recovery from
small trees is less than
from larger ones. For
example, the average
board foot of lumber cut
from 7-inch trees is
worth only 87 percent as
much as the average board
foot cut from 11-inch
trees, (fig. 11). Since
lumber grade recovery is
better in the smaller
trees, the lower value
per board foot must be
blamed on the high percent-
age of narrow boards
which the smaller trees
produce.

CAPACITY OF THE LODGEPOLE PINE LUMBER INDUSTRY TO COMPETE

THE SPECIES IS BECOMING
ESTABLISHED IN THE LUM-
BER MARKET

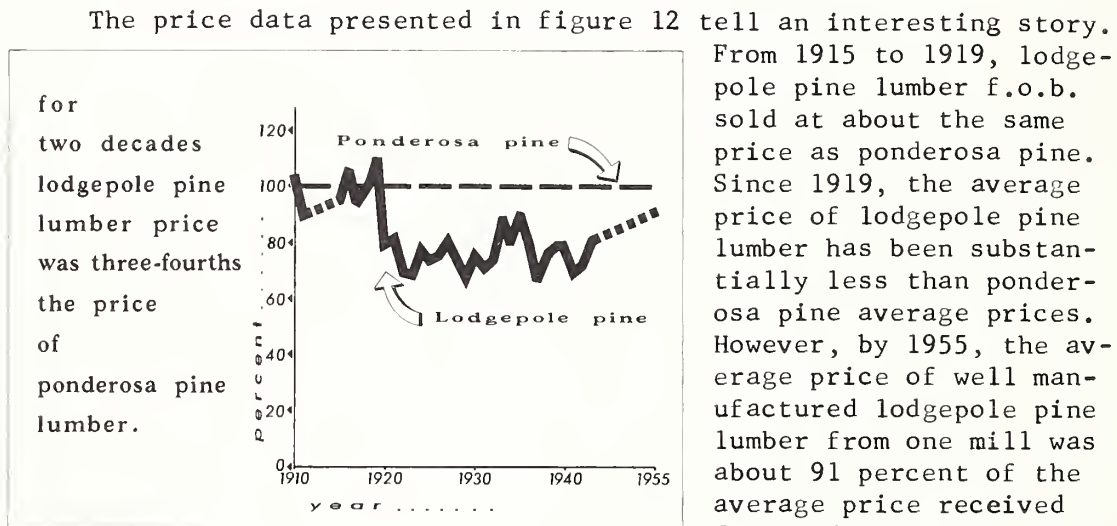


Figure 12

The currently higher average selling value of ponderosa pine only means that the species produces more select grade lumber and fewer narrow boards than lodgepole pine. Grade for grade, prices received should be about the same. One first-class sales organization has been able to get approximately as much for lodgepole pine 1 x 8 boards in the high common grades as it has for ponderosa pine of the same width and grades.

Lodgepole pine appears to have some advantages for paneling stock. As mentioned, it is slightly harder than ponderosa pine; in addition, it has smaller knots, the wood is lighter in color and will not darken as much with age. Forty-nine percent of the lodgepole pine lumber produced at one modern mill in 1955 was made into knotty pine paneling, and in the long run, this may be one of the more promising outlets for the species.

Paneling stock brings higher prices than plain boards. Selling prices in most sizes and grades were \$10.00 or more above what the

material would have brought as boards. Additional information on selling prices is presented in tables 6 and 7.

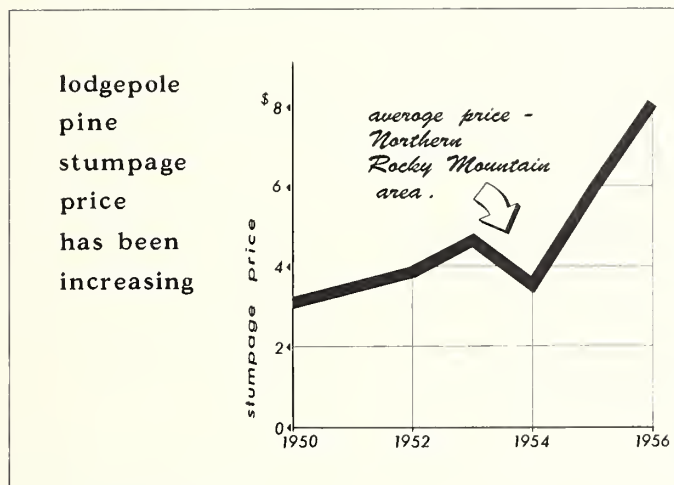


Figure 13

THE DEMAND FOR LODGEPOLE PINE LUMBER IS INCREASING

The trend in lodgepole stumpage prices is upward. This indicates a growing demand for the species for lumber. In 1950, for example, lodgepole pine on the national forests of North Idaho and Montana sold for \$3.10 a thousand board feet. By 1956, the price had risen to over \$8.00, (fig. 13). On a

recent national forest sale in western Wyoming, lodgepole pine brought \$9.75 a thousand board feet.

THE COMPETITIVE POSITION OF LODGEPOLE PINE CAN BE IMPROVED

The timber supply situation in the United States has changed to the advantage of lodgepole pine and now we can begin to emphasize its attributes for lumber. While lodgepole pine does not yield enough select boards to share in the market for the highest quality material, the grade recovery is certainly satisfactory and the lumber should be in demand for many uses.

The experience of a few sawmills pioneering in the production of lodgepole pine lumber for the national market is encouraging. Their experience lends weight to the opinion that much of our lodgepole pine could well go into lumber. However, this same experience also points to the desirability of overcoming the handicap of tree size which we have described. Right now, there are three ways the competitive position of lodgepole pine can be further improved.

1. Reduce manufacturing costs. Considerable progress has been made in reducing the sawing time for small trees. Studies made in conventional band mills a decade or two ago show tree size in the 10- to 20-inch diameter range had a marked effect on sawing time. Our study in a modern mill designed

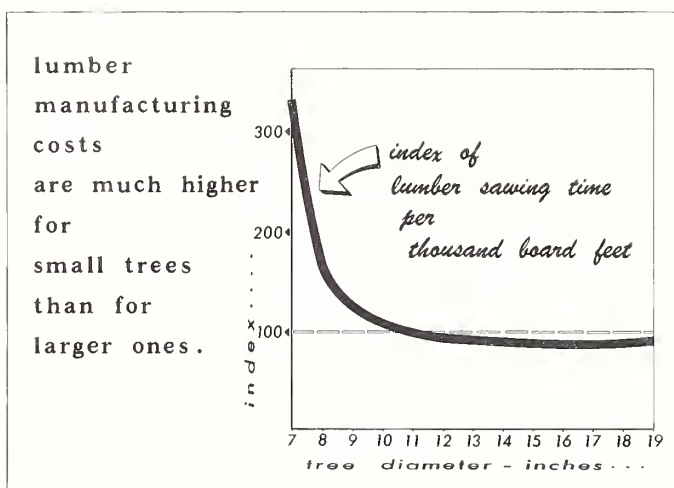


Figure 14

2. Increase lumber recovery. As figure 7 shows, the poorest lumber recovery ratio per cubic foot of wood is in small

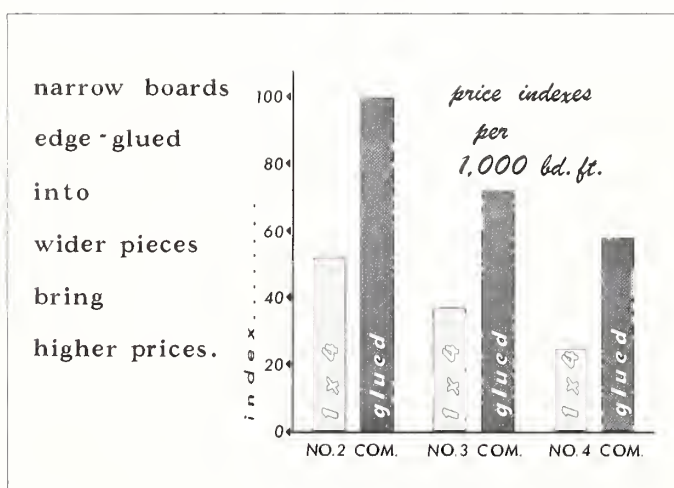


Figure 15

3. Overcome the handicap of narrow boards. The key to successful operation of a lodgepole pine mill is in marketing narrow boards. Some narrow width lodgepole pine lumber has been edge-glued into wider stock. Costs of the gluing operation are not available and the volume of glued-up material sold has been small so the comparisons shown in figure 15 may be premature. However, the comparative prices shown do suggest this might be one solution to the problem of narrow boards.

for small timber showed tree size has very little effect on sawing time for trees larger than 10 inches in diameter (fig. 14). However, while progress has been made, a large part of the volume in many of our lodgepole pine stands is in trees smaller than 10 inches in diameter and sawmill operators would gain if sawing time for these trees could be reduced.

An idea that has been tried to increase the lumber yield from small trees is to cut boards as narrow as 2 inches and also to produce 1- x 3- and 1- x 5- inch boards which are not now standard sizes. Data are not available to show how much additional lumber has been recovered by this practice but estimates run over 10 percent. While this is good utilization, it poses marketing problems.

The idea of edge-gluing needs to be explored further. If this operation does prove successful, it will not only solve the width problem, it will also solve the marketing problem of odd sizes. For example, two boards 3 inches wide would glue up to a 1 x 6; a 5-inch board and a 3-inch board would make a 1 x 8. Perhaps through re-manufacture to produce table tops, prefabricated cabinets, etc., marketing opportunities could be expanded and improved for glued-up stock, thus further strengthening the competitive position of this fine softwood.

Table 3.--Effect of lodgepole pine tree size on grade recovery at the Green Chain, Western Pine Association grades.
(From curved data)

Tree diameter	No. 2 common and better	No. 3 common	No. 4 common	No. 5 common	Total
<u>Inches</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>	<u>Percent</u>
7	66	20	10	4	100
8	65	21	10	4	100
9	64	21	10	5	100
10	63	22	10	5	100
11	62	23	10	5	100
12	60	25	10	5	100
13	59	25	10	6	100
14	58	26	10	6	100
15	57	27	10	6	100
16	56	27	10	7	100
17	55	28	10	7	100
18	53	30	10	7	100
19	52	31	10	7	100

Table 4.--Lodgepole pine lumber recovery by width classes for a typical mill--1955

Width class	Percent of total
4-inch ^{1/}	16.05
6-inch	42.22
8-inch	32.35
10-inch and over	9.38
Totals	100.00

^{1/} Does not include a small amount of 4-inch lumber that was edge-glued into wider stock.

Table 5.--Effect of lodgepole pine tree size on lumber width recovery
(From curved data)

Tree diameter Inches d.b.h.	Lumber width--inches						Total
	2-3	4-5	6	8	10	12	
7	24.9	59.2	15.9	-	-	-	100.0
8	17.9	70.9	11.2	-	-	-	100.0
9	10.7	54.5	34.0	0.8	-	-	100.0
10	6.5	33.8	46.8	12.9	-	-	100.0
11	5.3	27.4	43.1	24.2	-	-	100.0
12	4.7	23.7	36.7	34.9	-	-	100.0
13	4.1	20.4	31.0	42.3	2.2	-	100.0
14	3.5	17.3	26.1	48.8	4.3	-	100.0
15	2.8	14.3	22.1	43.7	17.1	-	100.0
16	2.3	11.1	19.7	39.1	27.8	-	100.0
17	1.7	8.4	17.6	35.9	36.4	-	100.0
18	1.1	6.2	15.6	32.6	33.6	10.9	100.0
19	0.5	4.5	14.0	29.1	31.7	20.2	100.0

Table 6.--Index of selling value of lodgepole pine by product and
grade, f.o.b. sawmill, 1955

Product and grade	Index of price ^{1/}
Selects D and better	187
No. 2 and better common boards	89
No. 3 common boards	67
No. 4 common boards	61
No. 5 common boards	42
No. 2 common paneling	110
No. 3 common paneling	80
No. 4 common paneling	65
Molding	121
Average	88

^{1/} Price of No. 2 and better 1 x 6 = 100

Table 7.--Index price in relation to lumber width for common grades of lodgepole pine boards and paneling for a typical mill--1955

Product size and grade	Price as a percent of the price for 8-inch lumber
	<u>Percent</u>
No. 2 and better common boards	
1 x 4	85
1 x 6	88
1 x 8	100
1 x 10	103
1 x 12	102
No. 3 common boards	
1 x 4	80
1 x 6	92
1 x 8	100
1 x 10	97
No. 4 common boards	
1 x 4	57
1 x 6	87
1 x 8	100
1 x 10	90
No. 2 and better common paneling	
1 x 6	100
1 x 8	100
1 x 10	100
No. 3 common paneling	
1 x 6	98
1 x 8	100
1 x 10	100

Table 8.--Effect of lodgepole pine tree size on sawing time.^{1/} (From
curved data)

Tree diameter	Index of sawing time per M board feet lumber tally
<u>Inches</u>	<u>Percent</u> ^{2/}
7	331
8	166
9	123
10	108
11	100
12	94
13	92
14	90
15	89
16	88
17	87
18	89
19	92

1/ From time log enters head saw until last board clears resaw.

2/ 11-inch trees = 100

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